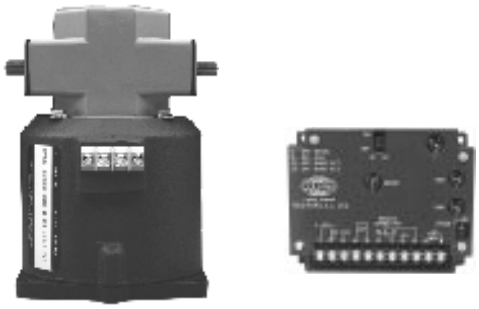
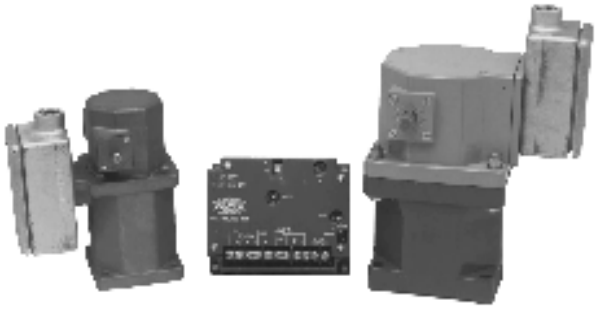
TECHNICAL MANUAL
FOR
DYNA 8000, 8200 & 8400
ELECTRONIC GOVERNOR

DYNA 8000



DYNA 8200

DYNA 8400



DYNA 8000-400 & DYNA 8400-400

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1. GENERAL INFORMATION

1.1 INTRODUCTION

The DYNA 8000, DYNA 8200 and DYNA 8400 governor system provides an engine governor for speed and power control of piston and gas turbine engines or steam and water turbines.

The actuator is a simple, proportional, electric solenoid having a sliding armature whose magnetic force is proportional to input coil current. The armature glides on anti-friction bearings and is balanced between the force of its return spring and the magnetic force, thus providing a hysteresis-free linear movement. The linear motion is converted to an output shaft rotation by a crank arm.

The hazardous duty DYNA 8000 and DYNA 8400 actuators provide units that are UL listed for Class I, Division 2, Group D, hazardous duty applications that are often encountered in the petroleum or chemical industries. The hazardous duty actuators can be used to provide an engine governor for speed and power control of piston and gas turbine engines.

1.2 TYPICAL APPLICATIONS

Typical applications are speed governing, remote throttle control, generator sets, power carts and pump set applications.

1.3 STANDARD FEATURES

- All electric
- All engine compatible
- Mounts in any position
- Engine mounted (actuator only)
- High reliability due to few moving parts
- Proportional actuator
- No hydraulic or oil lines
- No special maintenance
- Spring returns output shaft to minimum position on removal of power or loss of magnetic pickup signal
- Precise repeatability

2. SPECIFICATIONS

2.1 CONTROLLER SPECIFICATIONS

2.1.1 Operating Voltage: 12 VDC or 24 VDC ±20%

2.1.2 Ambient Operating Temperature:
-40 to +180°F (-40 to +85°C).

2.1.3 Temperature Stability: Better than ±0.5% over a temperature range of -40 to +167°F (-40 to +75°C).

2.1.4 Steady State Speed Band: ±0.25%

2.1.5 Adjustments: Speed, Gain, Integral, and Droop.

2.1.6 Circuit Boards: Boards are covered with a heavy conformal coating for moisture and vibration protection.

2.1.7 Connection: Terminal strip.

2.1.8 Mechanical Vibration: Withstands the following vibration without failure of degraded performance: 0.06 inch double amplitude at 5 to 18 Hz; 1 G at 18 to 30 Hz; 0.02 inch double amplitude at 30 to 48 Hz; 2.5 G's at 48 to 70 Hz.

2.1.9 The same DYN1-1065X or DYN1-1068X Series can be used on a DYNA 8000, DYNA 8200 or DYNA 8400 actuator. The DYN1-1068X governor control box provides a wider range of adjustment than the DYN1-1065X. The DYN1-1068X can be used where maximum performance is desired or for some engines which are possibly more difficult to control.

2.1.10 DYNA 8000 CONTROLLER

Output Current @ 12 VDC	Nominal Quiescent Current	80 mA
	Maximum Amperes @ Stall	13 amps
Output Current @ 24 VDC	Nominal Quiescent Current	80 mA
	Maximum Amperes @ Stall	13 amps
Weight	Kilograms	0.863
	Pounds	1.9

2.1.11 DYNA 8000 CONTROLLER INPUT SIGNAL FREQUENCY

$$\text{Input Signal Frequency in Hertz} = \frac{\text{Engine RPM x Number of Gear Teeth on Flywheel}}{\text{60 Seconds}}$$

Select controller for the correct input signal frequency range generated by the magnetic pickup at the maximum engine operated (RPM) speed.

2.1.12 AVAILABLE CONTROLLER MODELS

Controllers: Speed	Input Signal Frequency
• DYN1-10652-000-0-12/24	250 - 1200 Hz
• DYN1-10653-000-0-12/24	1200 - 2500 Hz
• DYN1-10654-000-0-12/24	2500 - 5000 Hz
• DYN1-10656-000-0-12/24	5000 - 9500 Hz
• DYN1-10682-000-0-12/24	250 - 1200 Hz
• DYN1-10683-000-0-12/24	1200 - 2500 Hz
• DYN1-10684-000-0-12/24	2500 - 5000 Hz
• DYN1-10686-000-0-12/24	5000 - 9500 Hz

2.2. DYNA 8000 & DYNA 8000 UL APPROVAL, HAZARDOUS DUTY, CLASS 1, DIVISION 2, GROUP D ACTUATOR SPECIFICATIONS

2.2.1 Operating Voltage: 12 VDC or 25 VDC ±20%

2.2.2 Ambient Operating Temperature:
-65 to +255°F (-55 to +125°C).

2.2.3 Sealed Unit: Oil, water and dust tight.

2.2.4 Connection: Terminal strip or "MS" Connector.

2.2.5 Mechanical Vibration: 5 to 500 Hz, Curve F, per MIL-STD. 810D, Method 514-2.

2.2.6 DYNA 8000 ACTUATORS

Work	Joules	1.2
	Foot-Pounds	0.9
Torque	Newton-Meters	1.4
	Pound-Foot	1.0
Output	Rotary	35°
Weight	Kilograms	5
	Pounds	11.0
Current @ 12 VDC	Maximum Amperes @ Stall	12.5
	Nominal Steady State Amperes	3.5
Current @ 24 VDC	Maximum Amperes @ Stall	9.5
	Nominal Steady State Amperes	1.5
Nominal Response Time for 63% of Stroke (Seconds)		0.030

2.2.7 AVAILABLE DYNA 8000 ACTUATOR MODELS WITH CLOCKWISE OUTPUT SHAFT ROTATION (Standard Mounted Units)

- DYNC-11020-000-0-12 Standard Clockwise
  DYNC-11020-000-0-24 Output Shaft Rotation
- DYNC-11021-000-0-12 Actuator Head Positioned 180°
  DYNC-11021-000-0-24 from Standard DYNC-11020
- DYNC-11022-000-0-12 Actuator Head Positioned 90°
  DYNC-11022-000-0-24 CCW from Standard DYNC-11020
- DYNC-11023-000-0-12 Actuator Head Positioned 90°
  DYNC-11023-000-0-24 CW from Standard DYNC-11020

2.2.8 AVAILABLE DYNA 8000 ACTUATOR MODELS WITH CLOCKWISE OUTPUT SHAFT ROTATION (Side Mounted Units)

- DYNC-11020-300-0-12 Standard Clockwise
  DYNC-11020-300-0-24 Output Shaft Rotation
- DYNC-11021-300-0-12 Actuator Head Positioned 180°
  DYNC-11021-300-0-24 from Standard DYNC-11020
- DYNC-11022-300-0-12 Actuator Head Positioned 90°
  DYNC-11022-300-0-24 CCW from Standard DYNC-11020
- DYNC-11023-300-0-12 Actuator Head Positioned 90°
  DYNC-11023-300-0-24 CW from Standard DYNC-11020

2.2.9 AVAILABLE DYNA 8000 ACTUATOR MODELS WITH COUNTERCLOCKWISE OUTPUT SHAFT ROTATION (Standard Mounted Units)

- DYNC-11024-000-0-12 Standard Clockwise
  DYNC-11024-000-0-24 Output Shaft Rotation
- DYNC-11025-000-0-12 Actuator Head Positioned 90°
  DYNC-11025-000-0-24 CW from Standard DYNC-11024
- DYNC-11026-000-0-12 Actuator Head Positioned 180°
  DYNC-11026-000-0-24 CCW from Standard DYNC-11024
- DYNC-11028-000-0-12 Actuator Head Positioned 90°
  DYNC-11028-000-0-24 CCW from Standard DYNC-11024

2.2.10 AVAILABLE DYNA 8000 ACTUATOR MODELS WITH COUNTERCLOCKWISE OUTPUT SHAFT ROTATION (Side Mounted Units)

- DYNC-11024-300-0-12 Standard Clockwise
  DYNC-11024-300-0-24 Output Shaft Rotation
- DYNC-11025-300-0-12 Actuator Head Positioned 90°
  DYNC-11025-300-0-24 CW from Standard DYNC-11024
- DYNC-11026-300-0-12 Actuator Head Positioned 180°
  DYNC-11026-300-0-24 CCW from Standard DYNC-11024
- DYNC-11028-300-0-12 Actuator Head Positioned 90°
- DYNC-11028-300-0-24 CCW from Standard DYNC-11024

2.2.11 AVAILABLE DYNA 8000 HAZARDOUS DUTY ACTUATOR MODELS WITH CLOCKWISE OUTPUT SHAFT ROTATION (Standard Mounted Units)

- DYNC-11020-400-0-12 Standard Clockwise
  DYNC-11020-400-0-24 Output Shaft Rotation
- DYNC-11021-400-0-12 Actuator Head Positioned 180°
  DYNC-11021-400-0-24 from Standard DYNC-11020
- DYNC-11022-400-0-12 Actuator Head Positioned 90°
  DYNC-11022-400-0-24 CCW from Standard DYNC-11020

2.2.12 AVAILABLE DYNA 8000 HAZARDOUS DUTY ACTUATOR MODELS WITH COUNTERCLOCKWISE OUTPUT SHAFT ROTATION (Standard Mounted Units)

- DYNC-11024-400-0-12 Standard Clockwise
  DYNC-11024-400-0-24 Output Shaft Rotation
- DYNC-11025-400-0-12 Actuator Head Positioned 90°
  DYNC-11025-400-0-24 CW from Standard DYNC-11024
- DYNC-11026-400-0-12 Actuator Head Positioned 180°
  DYNC-11026-400-0-24 CCW from Standard DYNC-11024

2.2.13 AVAILABLE DYNA 8000 HAZARDOUS DUTY ACTUATOR MODELS WITH CLOCKWISE OUTPUT SHAFT ROTATION (Side Mounted Units)

- DYNC-11020-401-0-12 Standard Clockwise
  DYNC-11020-401-0-24 Output Shaft Rotation
- DYNC-11021-401-0-12 Actuator Head Positioned 180°
  DYNC-11021-401-0-24 from Standard DYNC-11020
- DYNC-11022-401-0-12 Actuator Head Positioned 90°
  DYNC-11022-401-0-24 CCW from Standard DYNC-11020

2.2.14 AVAILABLE DYNA 8000 HAZARDOUS DUTY ACTUATOR MODELS WITH COUNTERCLOCKWISE OUTPUT SHAFT ROTATION (Side Mounted Units)

- DYNC-11024-401-0-12 Standard Clockwise
  DYNC-11024-401-0-24 Output Shaft Rotation
- DYNC-11025-401-0-12 Actuator Head Positioned 90°
  DYNC-11025-401-0-24 CW from Standard DYNC-11024
- DYNC-11026-401-0-12 Actuator Head Positioned 180°
  DYNC-11026-401-0-24 CCW from Standard DYNC-11024

2.3 DYNA 8200 ACTUATORS

2.3.1 Operating Voltage: 12 or 24 VDC ±20%.

2.3.2 Ambient Operating Temperature:
-65 to +255F (-55 to +125°C).

2.3.3 Sealed Unit: Oil, water and dust tight.

2.3.4 Connection: Terminal strip or "MS Connector.

2.3.5 Mechanical Vibration: 5 to 500 Hz, Curve F, per MIL-STD. 810D, Method 514-2.

Work	Joules	2.85
	Foot-Pounds	2.10
Torque	Newton-Meters	4.07
	Pound-Foot	3.00
Output	Rotary	45°
Weight	Kilograms	8.4
	Pounds	18.5
Current@ 12 VDC	Maximum Amperes @ Stall	14.75
	Nominal Steady State Amperes	4.5
Current @ 24 VDC	Maximum Amperes @ Stall	14.0
	Nominal Steady State Amperes	3.5
Nominal Response Time for 63% of Stroke (Seconds)		.138

2.3.6 AVAILABLE DYNA 8200 ACTUATOR MODELS WITH CLOCKWISE OUTPUT SHAFT ROTATION

- DYNC-12000-000-0-12 Standard Clockwise
  DYNC-12000-000-0-24 Output Shaft Rotation

- DYNC-12001-000-0-12 Actuator Head Positioned 180°
  DYNC-12001-000-0-24 from Standard DYNC-12000

- DYNC-12002-000-0-12 Actuator Head Positioned 90°
  DYNC-12002-000-0-24 CCW from Standard DYNC-12000

- DYNC-12003-000-0-12 Actuator Head Positioned 90°
  DYNC-12003-000-0-24 CW from Standard DYNC-12000

2.4 DYNA 8400 & DYNA 8400 UL APPROVAL, HAZARDOUS DUTY, CLASS 1, DIVISION 2, GROUP D ACTUATOR SPECIFICATIONS

2.4.1 Operating Voltage: 24 VDC ±20%.

2.4.2 Ambient Operating Temperature:
-65 to +255F (-55 to +125°C).

2.4.3 Sealed Unit: Oil, water and dust tight.

2.4.4 Connection: Terminal strip or "MS Connector.

2.4.5 Mechanical Vibration: 5 to 500 Hz, Curve F, per MIL-STD. 810D, Method 514-2.

2.4.6 DYNA 8400 ACTUATORS

Work	Joules	5.8
	Foot-Pounds	4.3
Torque	Newton-Meters	7.3
	Pound-Foot	5.4
Output	Rotary	45°
Weight	Kilograms	12.2
	Pounds	27
Current @ 24 VDC	Maximum Amperes @ Stall	13
	Nominal Steady State Amperes	2.0
Nominal Response Time for 63% of Stroke (Seconds)		0.104

2.4.7 AVAILABLE DYNA 8400 ACTUATOR MODELS WITH TERMINAL STRIP CONNECTION

- DYNC-14800-000-0-24 Through Output Shaft Making
  Available CW and CCW Output

2.4.8 AVAILABLE DYNA 8400 ACTUATOR MODELS WITH 2-PIN MS SCREW ON CONNECTOR

- DYNC-14801-000-0-24 Through Output Shaft Making
  Available CW and CCW Output

2.4.9 AVAILABLE DYNA 8400 HAZARDOUS DUTY ACTUATOR WITH TERMINAL STRIP CONNECTION INSIDE CAST IRON JUNCTION BOX

- DYNC-14800-400-0-24 Through Output Shaft Making
  Available CW and CCW Output

3. FUNCTIONAL DESCRIPTION

3.1 ACTUATOR

The actuator consists of an electro-magnet with an iron armature rolling on the center shaft bearings. The actuator is provided with a return spring which balances the magnetic force of the armature. When DC current flows in the coil, the magnetic force tends to move the armature in the stator and this linear motion is transformed into rotary motion through a crank arm that forms part of the output shaft.

3.2 CONTROLLER

The electronic controller is the information processing unit of the governor assembly. It contains electronic components which process the input signal from the magnetic pickup and control the engine to the desired speed/RPM set into the controller. Electronic adjustments are available on the controller for field adjusting the unit as necessary.

3.3 DC POWER SOURCE

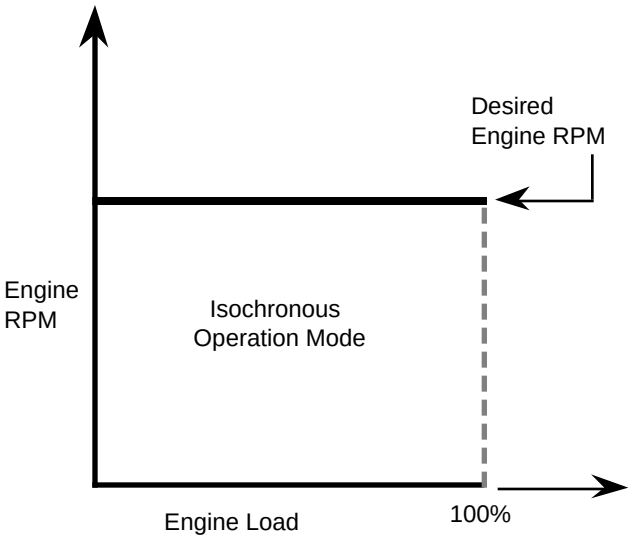
The governor system receives its power from a battery or an AC to DC power supply supplying 12 or 24 VDC ±20% to match the governor voltage. The average operating current consumption is 2.5 to 3.5 amperes and the highest consumption is 14.75 amperes during engine start-up or during a large load change. The power source must be rated above maximum stall current.

3.4 COMPONENT LOCATION

The actuator of the governor assembly is mounted on the engine next to the fuel system. The magnetic pickup is normally mounted in the flywheel housing in such a way that it can count the teeth on the starter ring gear. The controller is off-mounted or installed in the engine control panel or cabinet.

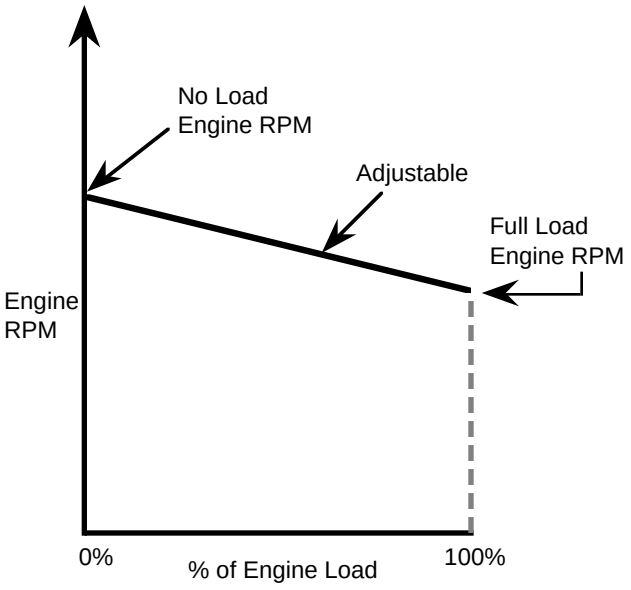
3.5 ISOCHRONOUS OPERATION

Isochronous operation is obtained by setting droop potentiometer fully counterclockwise. The DYNA governor is all electric, and it is normally operated in the isochronous mode; i.e., engine RPM is constant (±0.25%) under steady state load conditions, up to the engine's maximum capability, regardless of load on the engine.



3.6 DROOP OPERATION

Droop operation is obtained by setting the droop potentiometer. Clockwise increases the droop. The amount of droop for a given setting depends on the magnetic pickup frequency and no load to full load actuator shaft rotation. A droop potentiometer setting of 10 o'clock will give about 4% droop, no load to full load when the pickup frequency is 4260 Hz and actuator shaft rotation is approximately 30 degrees from no load to full load. Lower pickup frequency or smaller shaft rotation results in less droop for the system.



3.7 REMOTE SPEED ADJUSTMENT

An optional remote speed selector (DYNS-10000) is available for adjusting engine RPM from up to 90 meters (300 ft.) from the engine. See the Electrical Wiring Schematic. The potentiometer can be connected for a narrow (fine) or wide speed range control.

4. INSTALLATION

4.1 PROCEDURE

4.1.1 Mount the actuator on a suitable rigid steel bracket or plate.

NOTE

Mounting information and kits are usually available for a particular engine. Contact Sales Representative.

4.1.2 Set up the linkage and rod end bearings (see 4.2).

4.1.3 Install the speed sensor with SAE threads (magnetic pickup)*.

*Magnetic pickups with metric threads are available. Thread — M16 x 1.5 — 6 g. Tap Drill Size — 14.5 ϕ mm.

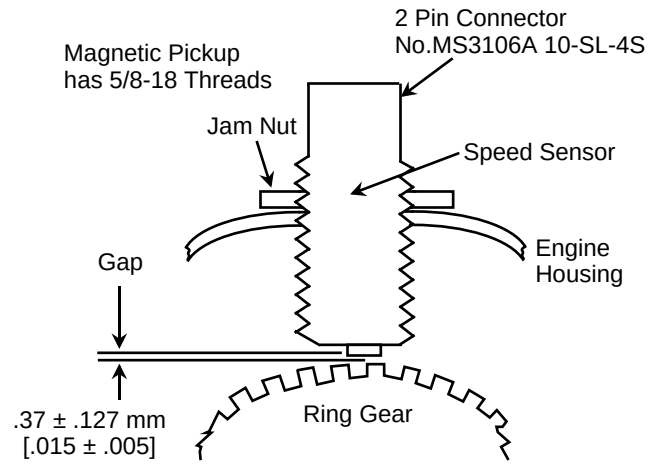
4.1.3.1 Remove the inspection cover over the ring gear teeth. The teeth should be free of burrs, excessive grease or dirt.

4.1.3.2 The magnetic pickup should not be installed in inspection covers. Inspect the ring gear housing and pick a location where a 37/64" hole can be drilled such that the ring gear teeth will pass in front of the pickup pole face. After the 37/64" hole is drilled, use a 5/8-18 starting tap to cut threads for the magnetic pickup, then run a bottom tap through the hole.

NOTE

The tapped hole should be drilled as nearly perpendicular as possible over the center of the ring gear teeth.

4.1.3.3 Manually rotate the ring gear until a tooth face is directly in the center of the tapped hole. Gently turn the magnetic pickup clockwise into the hole until it bottoms on the tooth, and back off 1/4 turn. Tighten the jam nut firmly, maintaining the 1/4 turn position.



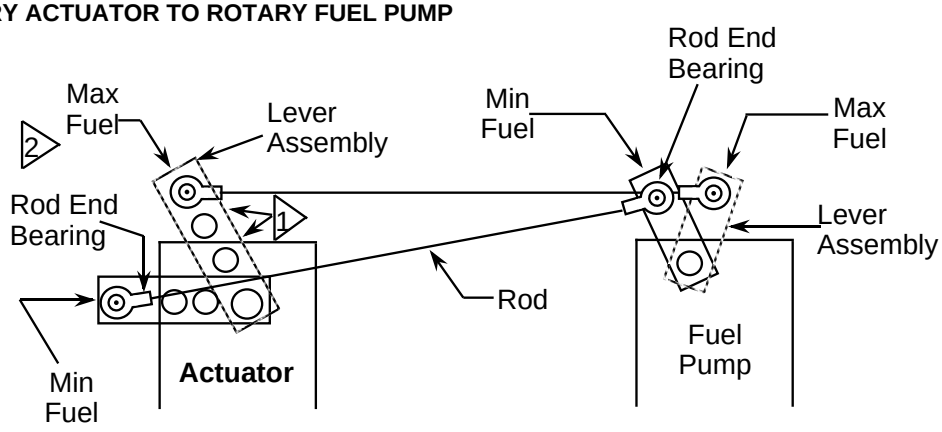
INSTALLATION OF MAGNETIC PICKUP

4.1.4 Mount the controller in the control panel.

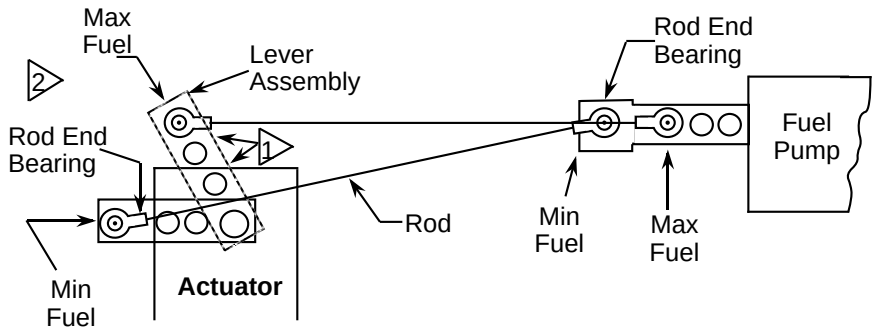
4.1.5 Connect the wiring as shown in section 4.3 or according to your particular wiring diagram.

4.2 TYPICAL LINKAGE ARRANGEMENTS FOR THE ACTUATOR AND FUEL SYSTEM

4.2.1 ROTARY ACTUATOR TO ROTARY FUEL PUMP



4.2.2 ROTARY ACTUATOR TO LINEAR FUEL PUMP

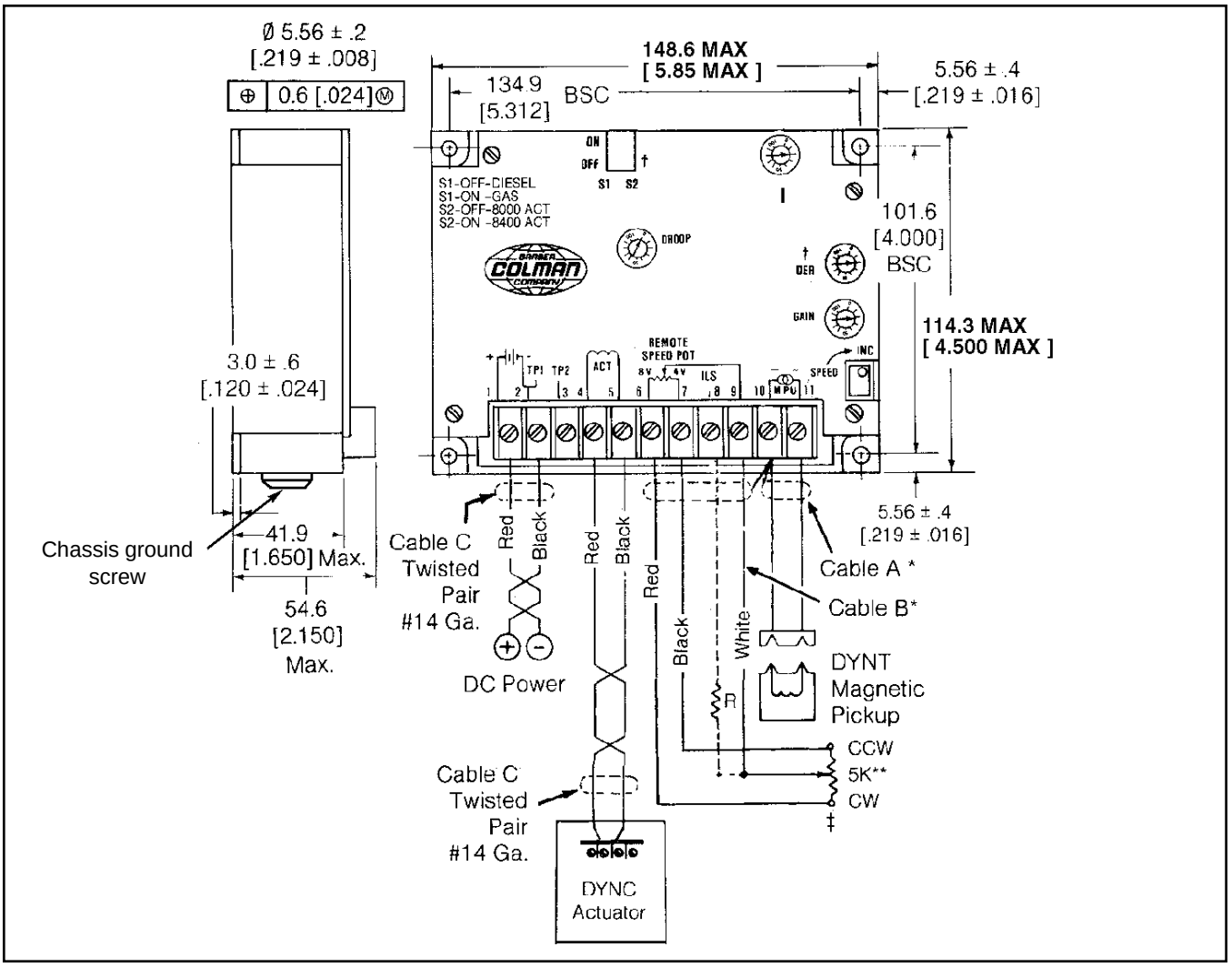


1 Choose hole in actuator lever which causes actuator to rotate through its maximum rotation to provide minimum to maximum fuel.

2 Non-Linear linkage to actuator is proper for best operation. Provides low GAIN at light loads and high GAIN at heavy loads.

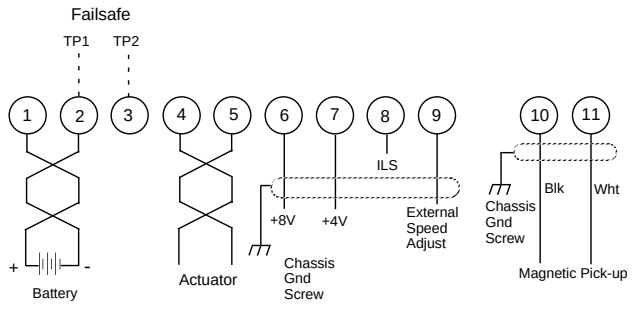
4.3 TYPICAL WIRING DIAGRAM & CONTROLLER INSTALLATION DIMENSIONS
DIMENSIONS -- DYNA 8000 CONTROLLER -- DYN1 1065X and DYN1 1068X

Dimensions are in mm except as otherwise noted.
Dimensions in [ ] are in inches.



Cable A --	DYNK-44-XX	(specify length) (90° connector)
Cable B --	E26-22	(specify length)
Cable C --	DYNZ-70-4	(specify length) (terminal strip)
Cable C --	DYNK-210	(specify length) (MS connector)

Wiring Diagram for CE Controllers



* Shielded cable -- Should be purchased from Barber-Colman or customer should purchase a cable with a wrapped mylar supported aluminum foil shield with a drain wire.

** Remote speed potentiometer and 499K ohm resistor is B-C P/N (DYNS-10000).

† The 5K remote speed potentiometer can be wired two different ways:

1. As shown by the solid line from the wiper of the 5K potentiometer and then connected to terminal #9 (no resistor required). Adjustable range is approximately ±5% at 1800 RPM.

2. As shown by the dashed line from the wiper of the 5K potentiometer through resistor R and then connected to terminal #8. Reducing the value of R increases the remote adjustable speed range.

5. CALIBRATION OF DYNA 8000 SERIES CONTROLLER — DYN1-1065X

Part Number	Input Signal Frequency Maximum
DYN1-10652-000-0-12/24 DYN1-10652-001-0-12/24*	250 to 1200 Hz
DYN1-10653-000-0-12/24 DYN1-10653-001-0-12/24*	1200 to 2500 Hz
DYN1-10654-000-0-12/24 DYN1-10654-001-0-12/24*	2500 to 5000 Hz
DYN1-10656-000-0-12/24 DYN1-10656-001-0-12/24*	5000 to 9000 Hz

* CE

NOTE

See Step 5.3 for proper procedures for setting switches S1 and S2, if you have a controller that has the two switches located on top of the controller.

5.1 CONNECTION INFORMATION

5.1.1 When using an ILS unit, the remote speed potentiometer may be left connected to the controller as shown.

5.1.2 When an ILS unit is used, connect 3-wire shielded cable to terminals 6, 7 and 8. Connect drain shield wire to terminal 10 at the controller only. Other end of drain shield wire is to be cut off and taped.

5.2 CALIBRATION AND ADJUSTMENTS

5.2.1 See diagram on page 8 for a reference guide before making any adjustments of the potentiometers, DROOP, I, GAIN and SPEED.

5.2.2 Power OFF - engine not operating.

5.2.3 Initial potentiometer settings:

5.2.3.1 Set the I adjustment three divisions from zero and the GAIN at the second division from zero.

5.2.3.2 For isochronous operation, set DROOP counterclockwise to minimum position as shown in paragraphs 3.5 and 3.6.

5.2.3.3 For DROOP operation, set DROOP potentiometer clockwise to obtain desired amount of DROOP from no-load to full load. Turning potentiometer clockwise increases DROOP.

NOTE

If the full 35° rotation of the actuator shaft is used and the linkage adjusted to use only the active fuel range, the maximum obtainable DROOP would be approximately 12% at full load.

5.3.3.4 See step 5.3 for setting switches S1 and S2.

5.2.4 If a remote speed potentiometer is used for narrow range, set it to mid-range. If the remote speed potentiometer is connected to terminals 6, 7 and 9, a resistor "R" in the wiper is not needed. This will provide approximately a ±5% adjustable speed range.

5.2.5 Start the engine.

5.2.5.1 Adjust the controller speed potentiometer until the engine is operating at the desired engine RPM. Clockwise increases engine RPM.

5.2.5.2 If the governor system is unstable, slightly reduce the GAIN setting.

NOTE

Except for the speed adjustment, the potentiometers have internal stops at the 0 and 100% positions.

5.2.6 With the engine unloaded, finalize the settings, I and GAIN adjustments as follows:

5.2.6.1 Turn the GAIN adjustment clockwise slowly until the actuator lever oscillates. (One may need to disturb actuator lever to cause oscillation.) Reduce the GAIN adjustment slowly counterclockwise until the lever is stable. Upset the lever by hand. If the lever oscillates 3 to 5 diminishing oscillations and stops, the setting is correct.

If system performance to load changes is satisfactory, omit step 5.2.6.2.

5.2.6.2 Reduce the GAIN setting counterclockwise one division. Next, turn the I adjustment fully clockwise while observing the actuator lever. If the lever does not become unstable, upset it by hand. When the lever slowly oscillates, turn the adjustment counterclockwise slowly until the lever is stable. Upset the lever again; it should oscillate 3 to 5 times and then become stable for optimum response.

NOTE

Use the settings of step 5.2.6.1 or step 5.2.6.2, whichever provides the best performance.

5.2.6.3 Unit is now calibrated.

5.3 ALL CONTROLLERS WITH REVISION J AND ABOVE HAVE SWITCHES S1 AND S2

These units have two new features now added to the DYN1 1065X series controllers. They are:

5.3.1 Two response ranges, for matching either the diesel or gas engine dynamics.

- Set S1 to the OFF position for diesel engine applications.
- Set S1 to the ON position for gas/gasoline engine applications.

5.3.2 Two actuator selections, so the same controller can be used on the DYNA 8000, DYNA 8200 or DYNA 8400 actuator.*****

- Set S2 to the OFF position when using a DYNA 8000 actuator.
- Set S2 to the ON position when using a DYNA 8200 or DYNA 8400 actuator.

5.4. GENERAL INFORMATION ON S1 AND S2

- Switch S1 selects one of two integrating rate ranges. The diesel version integrates at twice the rate of the gas version
- Switch S2 selects the point at which actuator coil current level causes the integrator limit to be actuated. This level is nominally 6.3 amperes for the DYNA 8000 and 7.3 amperes for the DYNA 8200 and 8400 actuator.

***** DYNA 8000 -- DYNC 11020 Series
DYNA 8200 -- DYNC 12000 Series
DYNA 8400 -- DYNC 14800 Series

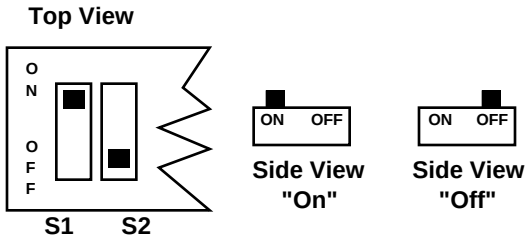
These actuators do not have a potentiometer feedback transducer.

NOTE

For some diesel engines, better operation may be obtained by placing SW1 in "ON" position. If difficulty is experienced in "OFF" position, try SW1 ON and recalibrate.

5.5 PROPER PROCEDURES FOR SETTING SWITCHES S1 AND S2

Question: How do I know if the switches in the dual-in-line packages are correctly set as far as being in the OFF position or the ON position?



Answer: The drawings above should clarify any confusion about switch settings. The easiest way to set the switches is to apply pressure with a small pointed object until the switch clicks into position.

CAUTION

As a safety measure, the engine should be equipped with an independent overspeed shutdown device in the event of failure which may render the governor inoperative.

6. CALIBRATION PROCEDURE FOR 8000 GOVERNOR CONTROLLER — DYN1-10682, 10683, 10684, 10686

Part Number	Input Signal Frequency Maximum
DYN1-10682-000-0-12/24 DYN1-10682-001-0-12/24*	250 to 1200 Hz
DYN1-10683-000-0-12/24 DYN1-10683-001-0-12/24*	1200 to 2500 Hz
DYN1-10684-000-0-12/24 DYN1-10684-001-0-12/24*	2500 to 5000 Hz
DYN1-10686-000-0-12/24 DYN1-10686-001-0-12/24*	5000 to 9000 Hz

* CE

NOTE

See Step 6.4 for proper procedures for setting switches S1 and S2, if you have a controller that has the two switches located on top of the controller.

6.1 CALIBRATION PROCEDURE

6.1.1 Observe that potentiometer settings are adjustable from zero to 100%. Each small division is 10%. The speed potentiometer is 10K, 20 turn.

6.1.2 Set the small dip switch, S1, for the correct engine. (See paragraph 6.4) Set switch S2 in the "OFF" position for actuator DYNA 8000 or in the "ON" position for DYNA 8200 and 8400.

6.1.3 If a remote speed potentiometer is used for narrow range, set to mid range.

6.2 INITIAL POTENTIOMETER SETTINGS

GAIN	20%
I	20%
D	30%
DROOP	Zero

6.2.1 For isochronous operation, set DROOP counterclockwise to minimum position as shown in paragraphs 3.5 and 3.6.

6.2.2 For DROOP operation, set DROOP potentiometer clockwise to obtain desired amount of DROOP from no-load to full load. Turning potentiometer clockwise increases DROOP.

6.3 START ENGINE (NO LOAD)

6.3.1 Adjust the controller speed potentiometer for desired engine speed.

6.3.2 Adjust the GAIN potentiometer clockwise until the engine begins to hunt. (If the engine remains stable at 100% GAIN, physically disrupt the actuator linkage by hand.) With the engine hunting, turn the GAIN potentiometer counterclockwise until stable.

6.3.3 Repeat step 6.3.2 for the "D" setting.

6.3.4 Repeat step 6.3.2 for the "I" setting.

6.3.5 After calibration, it may be necessary to readjust the speed.

6.3.6 Following the above calibration, conduct the following test. With the engine operating at rated speed, turn the electric governor off. When engine speed slows to approximately half of rated speed, turn the electric governor back on. Observe the overshoot. If there is a small hunt at steady state, slightly turn the "I" potentiometer counterclockwise until stable. In some cases, 2 to 3 Hz overshoot may be acceptable.

WARNING

For gas engines, make certain that method used does not put gas in exhaust which might result in an explosion.

If possible, operate the unit through various load ranges up to 100% to ensure stability.

6.4 CONTROLLERS HAVE SWITCHES S1 AND S2

These units have two new features now added to the DYN1 1068X series controllers. They are:

6.4.1 Two response ranges for matching either the diesel or gas engine dynamics.

- Set S1 to the OFF position for diesel engine applications.
- Set S1 to the ON position for gas/gasoline engine applications.

6.4.2 Two actuator selections, so the same controller can be used on the DYNA 8000, DYNA 8200 or DYNA 8400 actuator.*

- Set S2 to the OFF position when using a DYNA 8000 actuator.
- Set S2 to the ON position when using a DYNA 8200 or DYNA 8400 actuator.

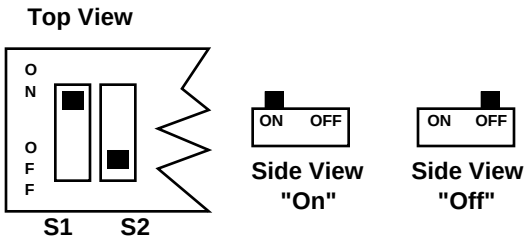
6.5 GENERAL INFORMATION ON S1 AND S2

- Switch S1 selects one of two integrating rate ranges. The diesel version integrates at twice the rate of the gas version.

- Switch S2 selects the point at which actuator coil current level causes the integrator limit to be actuated. This level is nominally 6.3 amperes for the DYNA 8000 and 7.3 amperes for the DYNA 8200 and 8400 actuator.

6.6 PROPER PROCEDURES FOR SETTING SWITCHES S1 AND S2

Question: How do I know if the switches in the dual-in-line packages are correctly set as far as being in the OFF position or the ON position?



Answer: The drawings above should clarify any confusion about switch settings. The easiest way to set the switches is to apply pressure with a small pointed object until the switch clicks into position.

***** DYNA 8000 -- DYNC 11020 Series
DYNA 8200 -- DYNC 12000 Series
DYNA 8400 -- DYNC 14800 Series

These actuators do not have a potentiometer feedback transducer.

NOTE

A warm engine is normally more stable than a cold one. If the governor is adjusted on a warm engine, turn the adjustment potentiometers counterclockwise 5% (1/2 div.) to ensure a stable engine when started cold.

CAUTION

As a safety measure, the engine should be equipped with an independent overspeed shutdown device in the event of failure which may render the governor inoperative.

7. DYNA 8000 SERIES TROUBLESHOOTING CHART

7.1 PROBLEM: GOVERNOR IS COMPLETELY DEAD AND ACTUATOR LEVER STAYS AT MINIMUM POSITION WHEN POWER IS APPLIED TO GOVERNOR.

	Means of Detection	Corrective Action
7.1.1	Check battery voltage at terminals 1 and 2 on controller. Terminal 1 is positive.	Check battery connections and contacts for turning power ON to the controller.
7.1.2	Check for proper linkage setup.	Correct and free linkage.
7.1.3	Magnetic pickup signal absent or too low. Measure AC voltage across terminals 10 and 11 while cranking the engine. Voltage should be min. 2.5 VAC. **Note:** The voltmeter should have an impedance of 5000 ohms/volts or higher.	Check pole tip gap over gear tooth. Should be .037 mm ±0.127 mm (0.015" ±0.005").
7.1.4	Measure the resistance of the magnetic pickup coil. This should be above 150 ohms.	If there is an open or shorted coil, replace the magnetic pickup.
7.1.5	Measure the resistance of each pin to the metal case of the magnetic pickup. No continuity should be evident.	If there is continuity to case, replace the magnetic pickup.
7.1.6	DC SUPPLY OFF. Place an insulated jumper between terminals 2 and 3 (TP1 & TP2). With DC ON, the actuator should go to full stroke. DC voltage at terminals 4 and 5 should be within 3 volts of the supply.	If the actuator still does not move to full stroke, continue with steps below.
7.1.7	Measure actuator coil resistance: <u>DYNA 8000</u> 12 VDC unit. Coil resistance 0.75 ±0.2 ohms. 24 VDC unit. Coil resistance 2.3 ±0.4 ohms. <u>DYNA 8200</u> 12 VDC unit. Coil resistance .710 ±0.2 ohms. 24 VDC unit. Coil resistance 1.600 ±0.4 ohms. <u>DYNA 8400</u> 24 VDC unit. Coil resistance 1.630 ±0.4 ohms.	If actuator coil is open or shorted to case, replace actuator. If governor still does not operate, continue with steps below.
7.1.8	Measuring the resistance of each coil lead to the actuator case should indicate an open circuit on a low scale of the ohm meter.	If continuity is detected, replace the actuator.
7.1.9	With the DC to the governor ON and the engine OFF, measure the DC voltage from terminal 6 (+) to terminal 2 (-). This should be approx. 8 VDC.	If 8 VDC is not present, replace the controller.
7.1.10	Between terminal 7 (+) to terminal 2 (-), the voltage should be approx. 4 VDC.	If 4 VDC is not present, replace the controller.

7.2 PROBLEM: ACTUATOR GOES TO FULL STROKE WHEN DC POWER IS TURNED ON (ENGINE IS NOT OPERATING).

	Means of Detection	Corrective Action
7.2.1	Check magnetic pickup leads for proper shielded wire or open shield.	Verify and correct wiring as necessary**.**
7.2.2	Be sure there is no jumper between terminals 2 and 3.	Verify and correct wiring as necessary.
7.2.3	Failsafe circuit in the controller may be damaged or defective.	Replace controller.
7.2.4	With DC power OFF remove leads at actuator. Check continuity of each terminal to case. There should be no continuity between any terminal and case of the controller.	If continuity is detected, replace the controller.
7.2.5	If remote speed potentiometer has been connected to terminals 6, 7 and 9 of the controller, DISCONNECT THESE LEADS.	Turn DC power ON to the governor if the actuator is now normal. Proceed to step 7.3.1.

7.3 PROBLEM: IMPROPER OPERATION FROM REMOTE SPEED POTENTIOMETER

	Means of Detection	Corrective Action
7.3.1	Investigate wiring to remote speed potentiometer for open or shorted circuits.	Check wiring.
7.3.2	If the leads at terminals 6 and 7 to the remote speed potentiometer are reversed, speed control by the remote speed potentiometer will be reversed.	Correct wiring.
7.3.3	Lead wire to remote speed setting potentiometer should be 3-wire shielded cable.	Verify that the drain shield wire is isolated from ground at the potentiometer.
7.3.4	If terminal 7 lead to the remote speed potentiometer is open, engine speed will go high.	Correct the wiring.
7.3.5	If lead 9 (wiper lead to remote potentiometer) is open, there will be no control by the remote speed potentiometer.	Verify and correct wiring.
7.3.6	If lead 6 to the clockwise terminal of the remote speed potentiometer is open, speed will remain at the value set in the controller.	

7.4 PROBLEM: ERRATIC GOVERNOR OPERATION

	Means of Detection	Corrective Action
7.4.1	Measure DC voltage at 1 and 2 on controller terminal strip. Normal battery voltage should be indicated.	If nominal voltage is present, wiring is correct.
7.4.2	Low battery voltage 20% below rated can cause erratic operation.	Check battery and charging system.
7.4.3	RFI noise due to incorrect shielding.	Correct wiring.
7.4.4	RFI noise fed through power supply leads.	Connect power leads directly to the battery.

7.5 PROBLEM: SLOW, SMALL AMPLITUDE HUNTING OF SPEED OR FREQUENCY

	Means of Detection	Corrective Action
7.5.1	Sticking or very loose linkage.	Correct Linkage.

7.6 PROBLEM: FAST OSCILLATION OF GOVERNOR LINKAGE

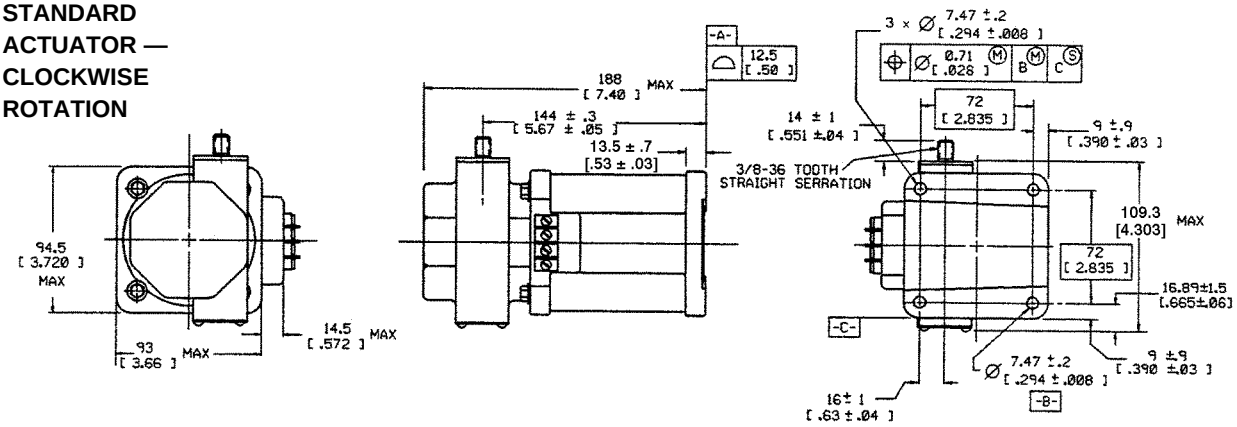
	Means of Detection	Corrective Action
7.6.1	Verify calibration settings of the controller.	Readjust settings as necessary.

7.7 PROBLEM: ENGINE WILL NOT START -- ACTUATOR GOES TO FULL FUEL DURING CRANKING

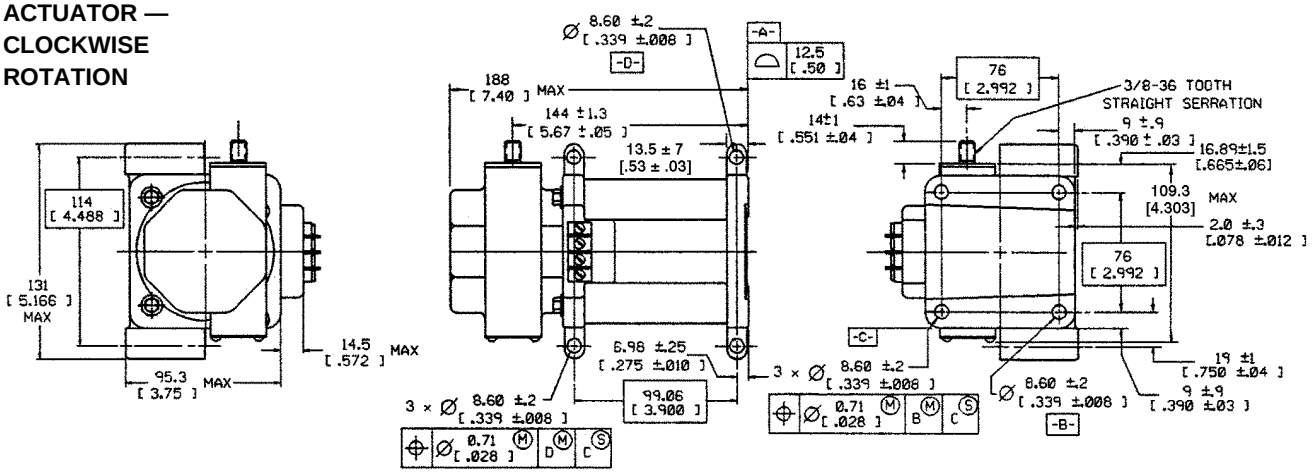
	Means of Detection	Corrective Action
7.7.1	Make sure fuel is available.	Check fuel to engine. Check for correct wiring to the automatic shutdown circuits.
7.7.2	Air may be trapped in fuel line.	Check fuel lines for leaks.
7.7.3	Try to operate engine manually.	

8. ACTUATOR INSTALLATION DIMENSIONS

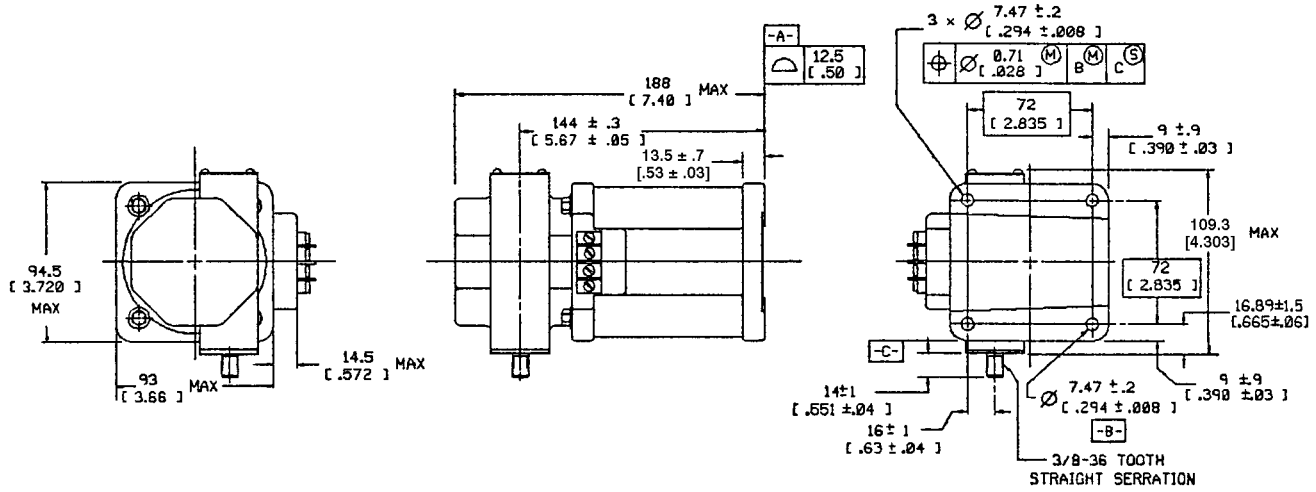
DYNC-11020-000 STANDARD ACTUATOR — CLOCKWISE ROTATION



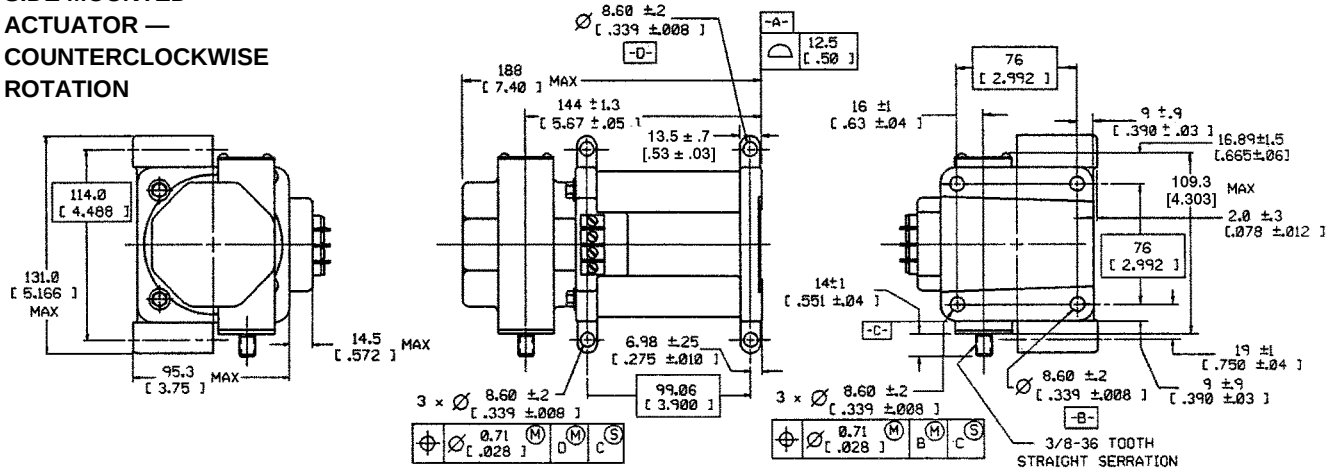
DYNC-11020-300 SIDE MOUNTED ACTUATOR — CLOCKWISE ROTATION



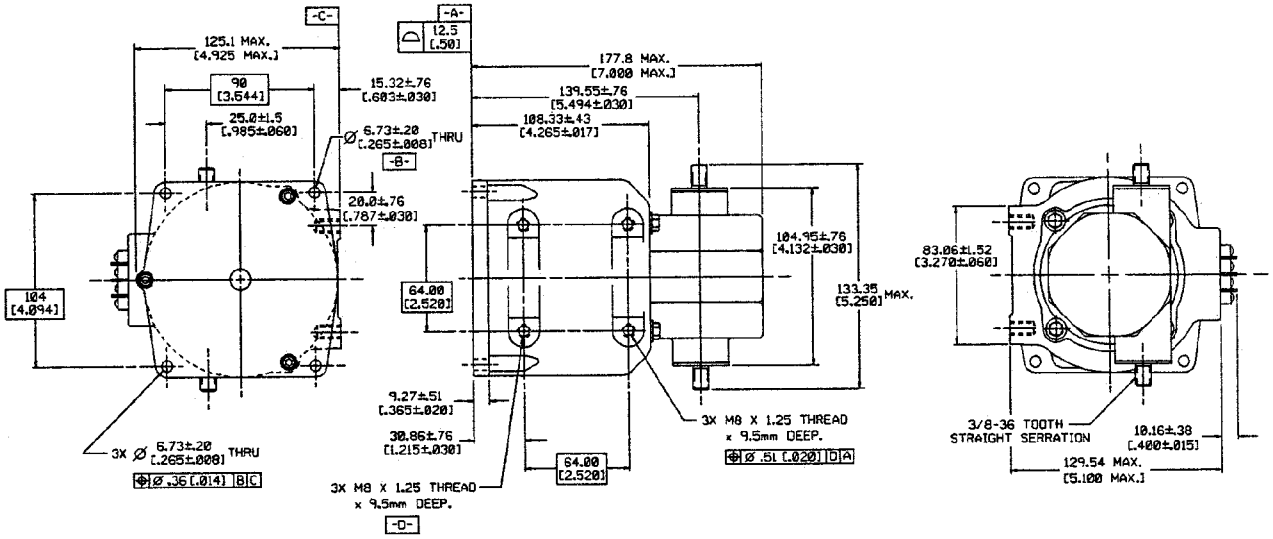
DYNC-11024-000



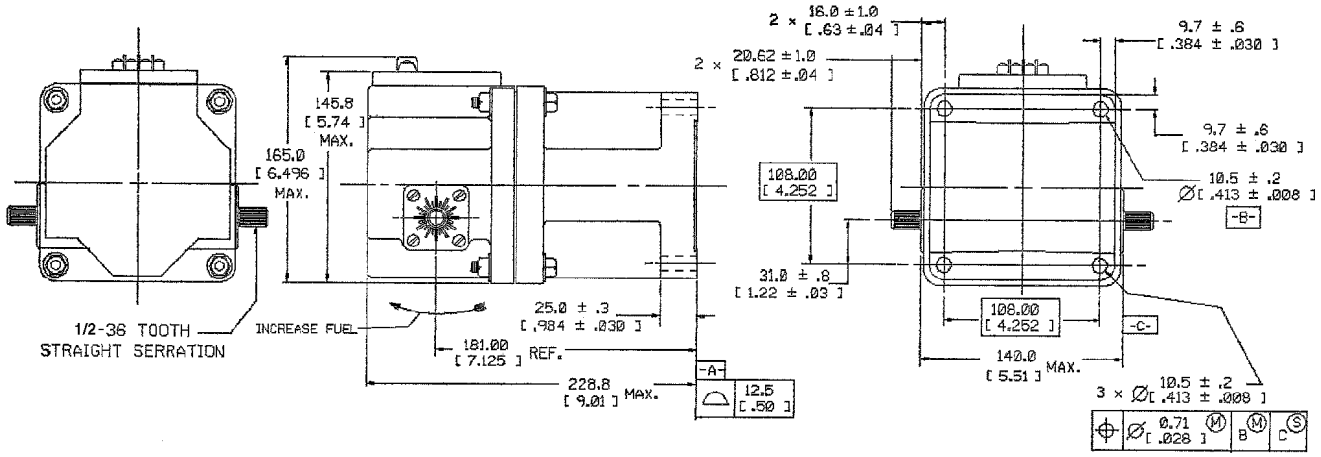
DYNC-11024-300 SIDE MOUNTED ACTUATOR — COUNTERCLOCKWISE ROTATION



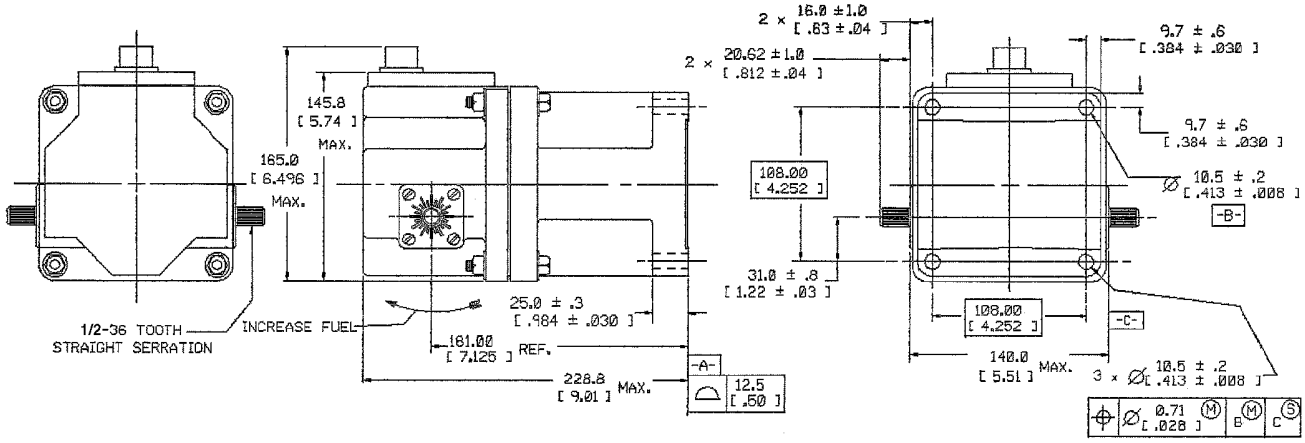
DYNC-12000-000



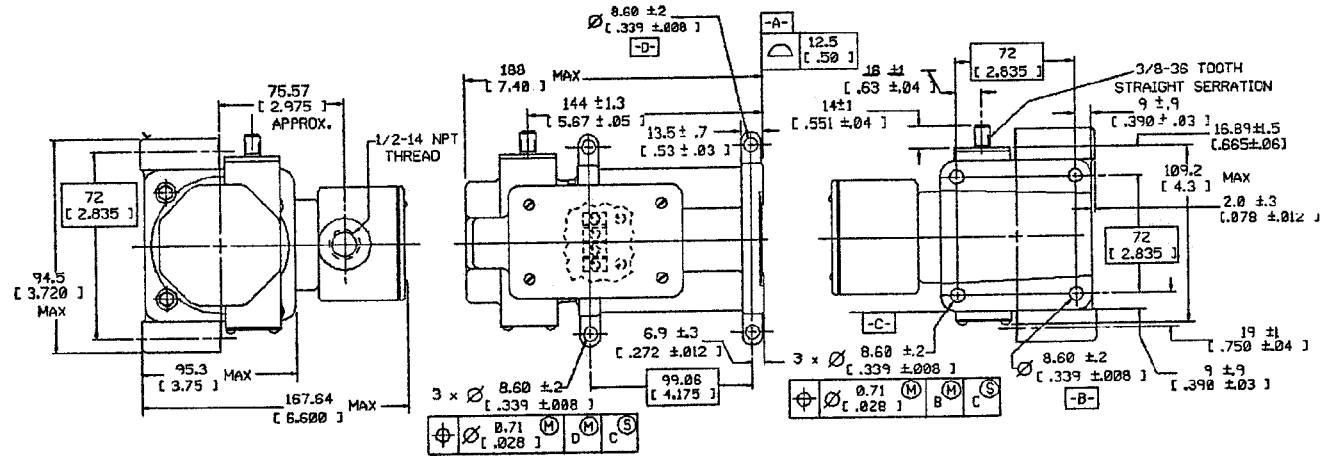
DYNC-14800-000
TERMINAL STRIP CONNECTION



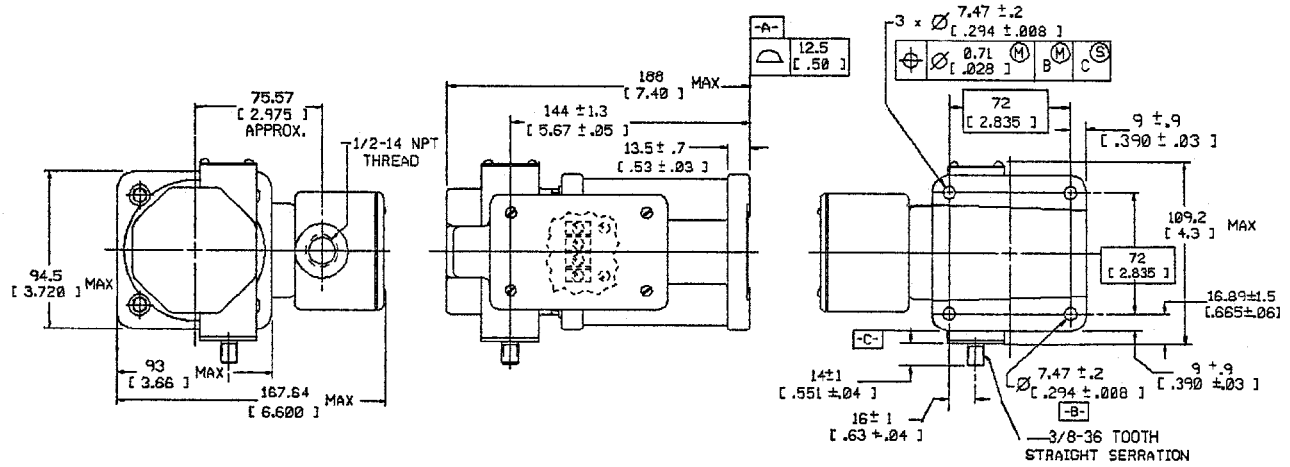
DYNC-14801-000
2-PIN MS CONNECTOR CONNECTION



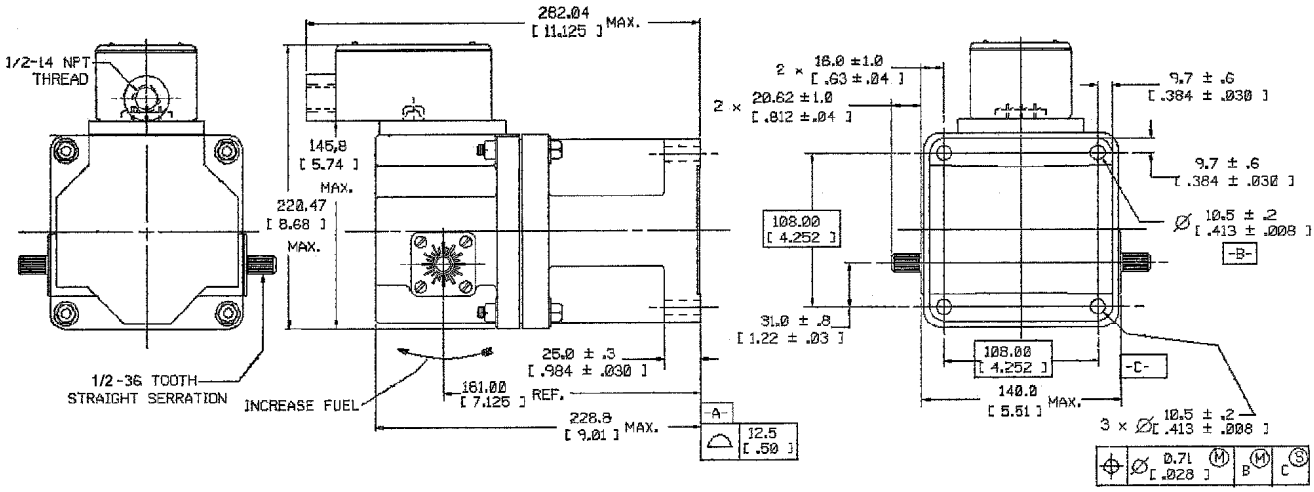
DYNC-11020-401
UL APPROVAL, HAZARDOUS DUTY, CLASS 1, DIVISION 2, GROUP D
CLOCKWISE UNIT



DYNC-11024-400
UL APPROVAL, HAZARDOUS DUTY, CLASS 1, DIVISION 2, GROUP D
COUNTERCLOCKWISE UNIT



DYNC-14800-400
UL APPROVAL, HAZARDOUS DUTY, CLASS 1, DIVISION 2, GROUP D



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